cervical fascia to the processes of the cervical vertebræ, and to each stylo-maxillary ligament.

3d. These superior tendinous crura of the diaphragm are connected together by transverse and oblique fibrous bands, thus forming a fibrous scaffolding for the support and protection of the heart and the great cardiac vessels.

4th. The opening in the fibrous scaffolding for the lodgment of the ductus arteriosus in fœtal life is closed by the contraction of the muscular fibres ascending on the fibrous pericardium from the anterior left side of the diaphragm in the neonatus.

5th. The blood in the pulmonary artery of the neonatus is *forced* into and through the right and left pulmonary arteries and into the lungs by the contraction of the right ventricle, which at this moment has its walls as thick as those of the left ventricle, and by the elasticity of the pulmonary artery, and is not *drawn* into the pulmonary arterial branches and into the lungs by the expansion of the lungs.

6th. The superior fibrous crura and the fibrous scaffolding between them are made tense and open for the lodgment and for the protection of the heart and its great vessels, and for the promotion of the circulation of the blood through them by the contraction of the muscular diaphragm, independent of the descent of its lateral wings, though in the descent of the lateral wings of the diaphragm the vertical area of the thorax is extended.

7th. In the contraction of the muscular diaphragm its descent is not necessary as it contracts on its own planes, which may be supported by the contraction of the stronger abdominal muscles.

8th. The diaphragm is rather an appendage of the circulatory apparatus, and not "essentially the chief agent in respiration."

1409 LOCUST STREET, PHILADELPHIA.

ARTICLE V.

A CASE OF FISTULA OF STENO'S DUCT FOLLOWING GUNSHOT WOUND, SUCCESSFULLY TREATED BY DISSECTING UP THE POSTERIOR EXTREMITY OF THE DUCT AND CONDUCTING IT INTO THE MOUTH, AFTER THE METHOD OF LANGENBECK, WITH SOME REMARKS UPON THE TREATMENT OF SALIVARY FISTULÆ.

By ERSKINE MASON, M.D., Surgeon to Bellevue and the Roosevelt Hospitals, Clinical Professor of Surgery Bellevue Hospital Medical College, New York.

ON the afternoon of Sept. 8, 1870, I was summoned out of the city to see a boy fifteen years of age, who, a few hours before, had been wounded by the accidental discharge of his gun, which was loaded with duck shot. He was in the attitude of leaning over the barrel at the time the discharge took place. I found a large lacerated wound of the right cheek, which freely communicated with the mouth, and extended from the zygoma to the symphysis of the jaw. The lower jaw was fractured transversely just below its neck, and the ramus considerably comminuted as far as its angle. Several of the teeth had been removed, while the tongue was but slightly wounded. The inferior dental nerve was exposed for an inch or more in its course, and presented a ragged appearance. Hemorrhage had been quite profuse, but was arrested by Dr. Jay, who, fortunately, was in the vicinity at the time of the accident. The patient had suffered from severe shock, but reaction was being established when I reached him. Several fragments of bone which were displaced and attached by a mere thread of periosteum required to be removed; this was done with as little disturbance of the periosteum as possible, and the exposed and torn portion of inferior dental nerve removed close to its emergence from the bone. The other portions of the wound were carefully cleaned, and the wound communicating with the mouth was approximated by strips of adhesive plaster, and dressed with picked lint, wet in a solution of carbolic acid and glycerin (1 to 20). Under the care of Drs. John C. Jay and Lounsberry everything progressed favourably, and the next time I saw the patient was in my office, Oct. 11th. The wound of the cheek had all closed save a small opening which communicated with the mouth, and readily allowed the passage of a probe, and through which some saliva was flowing. There was considerable consolidation of the jaw at this time, and the patient could open his mouth for the space of an inch; though when this was done, or when he laughed, the jaw would deviate to the left of the median line. Fearing that unpleasant contraction of the soft parts would result if remedial measures were not now employed, and the jaw appearing sufficiently firm, I ordered that the mouth be frequently opened as wide as possible, and he begin to take solid food, chewing upon the left side, he having up to this period been living upon fluids; at the same time the soft parts on the affected side be frequently stretched by the introduction of the finger into the mouth. Had not this plan been pursued I fear that the fracture which had occurred in the vicinity of the temporo-maxillary articulation would have led to anchylosis, whereas, by this line of practice, we were enabled to secure a false joint just below the point where the ramus joins the neck.

His next visit was on Oct. 21st, when I found that he had gained considerably as to the movement of the jaw. A small piece of detached bone was at this time removed from the direction of the symphysis. He complained considerably of saliva escaping from the wound on the cheek while eating. Application of the nitrate of silver was at this time made to the fistula.

From this date he progressed very favourably in every respect, there being greater freedom in the mobility of the jaw and less trouble from the saliva flowing down the cheek. When, on the 29th of Nov., I was called to see him, he informed me that he thought he had taken cold a few days before, and was suffering from a swelling just behind the lobe of the ear. There being evidence of suppuration at this point, it was opened, and the cause of the trouble found to depend upon a piece of necrosed bone, which was removed, and from this he recovered in a few days. Nitrate of silver was again applied to the fistula, which, however, seemed to give but slight annoyance.

The flow of saliva from the fistula, however, eventually increased, and became a source of great trouble, and, when I saw him again in Sept. 1871, there were now two openings from which saliva trickled and produced some excoriation of the face. These openings were but a few lines apart, and seemed to be a little below the site of Steno's duct, though the location was close to the spot where the duct enters the mouth—as was readily determined by a very fine probe which could be made to enter the canal from within the mouth. This probe could be only passed just within the orifice, where it met with obstruction. These fistulæ were situated in a tract of cicatricial tissue. His condition was now such that some radical steps were necessary for the relief of this distressing feature in the case, and he, as well as his friends, were anxious for something to be done to change the course of the saliva. In conversation at this time with Dr. James R. Wood, in reference to the treatment of this variety of fistula, he related two cases wherein he had been successful in cutting down upon the duct at the site of fistula and turning it into the mouth. In considering the various features of my case, I preferred this to the one of using the seton, so disagreeable had it proved in two cases where I had seen it employed in the hands of others. Another reason was, that I feared that the presence of the seton in this case, passing as it would have to through feeble cicatricial tissue, might lead to sloughing.

On the 24th of Feb. 1871, assisted by Dr. Jay, I proceeded to cut down upon Steno's duct, which fortunately was readily found by laying open the fistulous tracks, and, with a fine probe as a guide, I then dissected out the cicatricial tissue around the fistula, freed the extremity of the duct, and turned it in through an opening into the mouth. The external wound was then brought together by wire sutures. The upper portion of the wound healed at once very kindly, though at the lower portion there was some suppuration, and I feared the result of the operation, as, on the fourth day, a drop or two of what I took to be saliva tinged with blood trickled from the lower portion of the wound. Suppuration, however, soon ceased, and the wound healed, leaving my patient free from salivary fistula.

At the time of the operation I did not know that I was putting in practice the means suggested and adopted by Langenbeck in the treatment of these fistulæ.

Where this operation is feasible, I think it is one that commends itself to the favourable attention of the surgeon, though in many cases no doubt a more simple form of procedure may obtain a cure. I have never had the opportunity of again testing this method, but should not hesitate to do so in a case where sufficient healthy duct could be obtained and where cicatricial tissue would militate against other methods, or, what I should prefer in some cases, the cutting out of the fistula by means of a punch, and closing the external wound by suture, as suggested by the late Dr. Horner; which, to my mind, is a better method than by seton, being devoid of its disagreeable features. I am well aware, both from the literature of this subject and personal experience, that very many cases of fistula of the parotid or its duct that come under our care as the result of wounds, may be induced to heal by the use of such simple methods as the application of the hot wire or the nitrate of silver associated with compresses, and in some instances by the introduction of probes through the canal; while some cases have healed spontaneously after a shorter or longer interval. The case of Col. Guiney, on page 330 of the *Surgical History of the War*, part first, is a striking example of the spontaneous closure of fistula of Steno's duct following gunshot wound, which took place one year after the receipt of injury.

In this connection the following case of fistula of the parotid gland resulting from a pistol-shot wound, recently under my care, is an example:—

W. D., aged 22, was admitted into Roosevelt Hospital Dec. 31, 1879, who, shortly before admission, received a pistol-shot wound in the right cheek, his assailant being about seven feet distant; the ball entering about one and a half inches behind and three-quarters of an inch above the angle of the mouth, passing in a direction backwards and slightly outwards to a point two inches behind and on a level with the lobe of the ear, at which site the ball was extracted. It passed through the masseter muscle, and, though grazing the bone, produced no fracture. A drainage-tube was introduced through the wound, and the parts syringed with a solution of carbolic acid. On January 4th saliva began to dribble from the posterior wound, though it also entered the mouth through its natural channel. The flow of saliva through the posterior wound was quite steady, and at times so profuse as to soak the dressings and trickle down the neck. The discharge began to abate on the 16th of the month, and on the 26th it had ceased, and the tube was entirely removed; the wound closed, and the patient was discharged, cured, Jan. 31.

During our late war it would appear (*Surgical History of the Rebellion*) that but few cases of salivary fistula were met with, though the records of wounds of the face are numerous; the methods adopted for their relief being those of occlusion, cauterization, and frequent dilatation of the excretory orifice of the canal of Steno. The reason of fistula not being more frequently met with after gunshot wounds was supposed to be due to the laceration produced by the projectile usually sufficing to obliterate the salivary ducts.

The variety of methods that have been put in practice for the cure of salivary fistula proves how difficult the management of some cases have been.

Cauterization, compression, and ligature of the duct for the purpose of causing atrophy of the gland, as proposed by Viborg, his experiments upon animals towards the close of the last century proving to him that there was no danger in the procedure, were among the earlier methods adopted.

Then follows the mode by seton, which has been varied greatly in its application. Either passed through the natural duct for the purpose of dilatation, or else passed through the mouth by means of a trocar through the fistulous opening, or through a perforation made by the hot iron or an awl; all these modes seeking to create a new channel for the saliva.

The idea of dilating the duct appears to belong to Morand and Louis, who introduced a fine thread guided by a probe into the natural orifice of the duct, and withdrew it through the wound; this seton was gradually increased in size. When the saliva passed freely into the mouth, and when the ulcer had contracted to the periphery of the seton, the foreign body was then removed, the ulcer touched with astringents, and compress applied till it closed.

By the other method, when a communication with the mouth has been well established, and saliva flowing in the proper direction, the seton being withdrawn, the extended edges of the fistula are found and brought together by suture.

In place of the old method of dilating the duct by means of silk threads as practised by Morand and Louis, or by catgut and leaden wires maintained in the canal, as employed by others; the introduction of fine silver probes used at varying intervals has been substituted with pleasing success. Mr. Francis Mason, in his work on the "Surgery of the Face," cites an interesting case of cure brought about, by passing a probe through the mouth so as to emerge from the fistulous aperture in the cheek, then having bent the instrument slightly it was pushed along the duct as far as possible towards the gland. It was left in this position for the space of eight hours, and the operation again repeated after three days. After the first introduction of the probe, saliva ceased to flow from the opening in the cheek. In some cases we fear it might be no easy matter to pass a probe in this manner through the upper opening of the duct, though its prompt success in this case merits its further trial.

Mr. Pick, in the *Lancet*, for February 19, 1870, relates the following interesting case:—

> A girl 20 years of age was admitted into St. George's Hospital for a salivary fistula, which she had had from childhood, the result of abscess. It was a source of great annoyance from the constant dribbling of saliva. An attempt to pass a small probe down the canal to ascertain if an opening existed into the mouth was made. By using slight force he succeeded in passing the instrument a short distance, perhaps half an inch, but no further. On account of the size of the probe he abandoned the operation till a finer one could be procured. The following morning no saliva flowed from the fistula; her pillow, which formerly had been wet, was found dry; and she had lost the dryness of her mouth, from which she had greatly complained. She was under observation for a week or ten days, during which time she remained well.

Mr. Pick justly remarks that this case illustrates how recovery may sometimes take place in cases which at times are most intractable and difficult to cure. The result of this probing was no doubt sufficient to remove some obstacle, probably a small calculus which had prevented a spontaneous closure of the fistula, hence the rapidly effected cure.

As salivary fistula may arise from so many causes, and present various features and sources of location, be it situated in the course of Steno's duct, or of the ducts in the gland itself, or as it arises from sloughing the result of ptyalism, or follows gunshot or incised wounds, each case may demand separate study and varied modes of procedure. Yet, from the remarks on treatment in most of our text-books on surgery, one might be led to believe that the seton was the only and all-sufficient method in dealing with these cases, many of which have been found quite intractable.

Perhaps of all the operations thus far resorted to, the one which would seem applicable to many cases, which is simple in its procedure, and devoid of the unpleasantness necessarily attached to the seton, is the one devised by our countryman, the late Dr. Wm. E. Horner, of Philadelphia. It not only proved successful in his hands, but in those of others. Dr. Henry H. Smith, in his work on "Operative Surgery," states he has operated by this method in two patients with perfect success, the external parts healing by the first intention.

The operation is thus described: The patient being seated, with the head well supported by an assistant, a strong broad wooden spatula is introduced within the cheek of the affected side; this is held firmly by the assistant. The wound being then slightly elongated by incising its sides in the line of the zygomaticus major muscle, a round punch, like that used by saddlers, should be placed over the fistulous orifice, care being taken to avoid the anterior edge of the masseter muscle. Then, on pressing the punch firmly against the spatula within the mouth, a piece of the entire thickness of the cheek will be removed, and a fresh opening made directly into the mouth. The external wound, being accurately closed by sutures and adhesive strips, will usually heal kindly, and the internal opening be found to give free vent to the saliva.

ARTICLE VI.

A CASE OF OVARIOTOMY IN WHICH PHLEGMASIA DOLENS FOLLOWED THE OPERATION.

By WALTER F. ATLEE, M.D., of Philadelphia.

MRS. S. S., of Trenton, N. J., thirty-three years of age, medium size, rather healthy appearance, eight years married, never pregnant, always regularly menstruated, consulted me on account of abdominal enlargement, in February, 1880. This enlargement, the patient said, began six years before, in the lower part of the belly on the left side, and gradually increased, so that her general health was now seriously affected by interference with functions essentially vital, those of digestion, circulation, and respiration. She told me she had been under local treatment by electricity for a long time, having had over forty sittings. Her pulse was about 120. The belly measured forty-two inches in its greatest circumference; it seemed to project rather more on the left side than on the right. Fluctuation could not be felt through the whole mass, but it could undoubtedly be produced over the central portion.

This history and these particular symptoms, together with those com-